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Inaugural Essay,
on the
Nature and Properties
of the
Blood.

For the Degree of Doctor of Medicine.

in the
University of Pennsylvania.

By
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of
Pennsylvania.

Philadelphia, Jan 22nd 1828.

In writing an Inaugural dissertation, it is not to be presumed, that a student, closely confined to the common routine of Study, can adduce any thing very new or striking: - The judicious selection, and harmonious arrangement of facts, is all that can be reasonably expected from his inexperienced Pen.

Should the following Essay, evince a want of novelty or interest, the cause will not I trust, be imputed to want of Industry.

Así como quedaron las
mismas en la parte anterior se han
añadido también en este documento
nuevos elementos. Algunos de
estos son nuevos para poderse
explicar la evolución de los que
ya se han visto anteriormente.
También se han añadido
nuevos elementos de acuerdo
con la necesidad de explicar
los cambios que han sucedido
en el desarrollo de la ciencia
y en la forma de enseñarla en el
siglo XIX.

but, rather to the nature of the sub-
ject. -

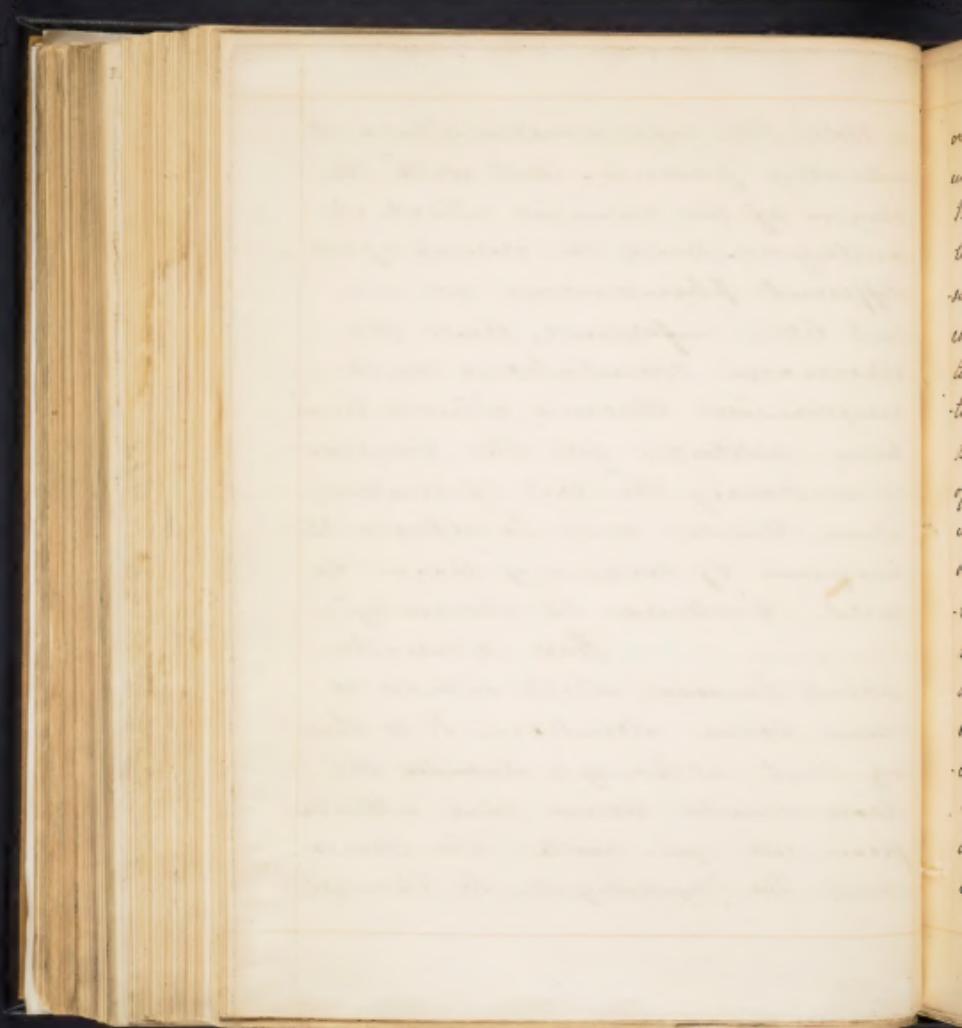
In making the Blood

the subject of the present Essay.
I have been influenced more by
the novelty of the subject, than
by any idea of my own compe-
tency to do it justice: - So well and
ably has it been treated of, by
the ever memorable, and justly
celebrated Hunter, that, it might
appear to some, presumptuous
in me, to enter upon a field
so much exhausted: - But, I rest
satisfied, well assured, that the
indulgence of the Faculty will
be granted. -

Few of the Laws of
the animal Economy, are more
intricate, than those that relate
to the blood: - It is, indeed, easy

to state the appearances which it usually presents. But, with the origin of the changes which it undergoes, and the causes of its different phenomena, we are but little informed. And the erroneous speculations and unfounded theories, which have been adduced for the purpose of removing the veil of nature, have tended only to retard the progress of inquiry, and to add, "Darkness to obscurity." -

There is another point however, which should receive some attention: - It is this, viz: that, although should the blood should receive due attention from all, - yet, - neither, the Anatomist, - The Physiologist, - The Chemist,



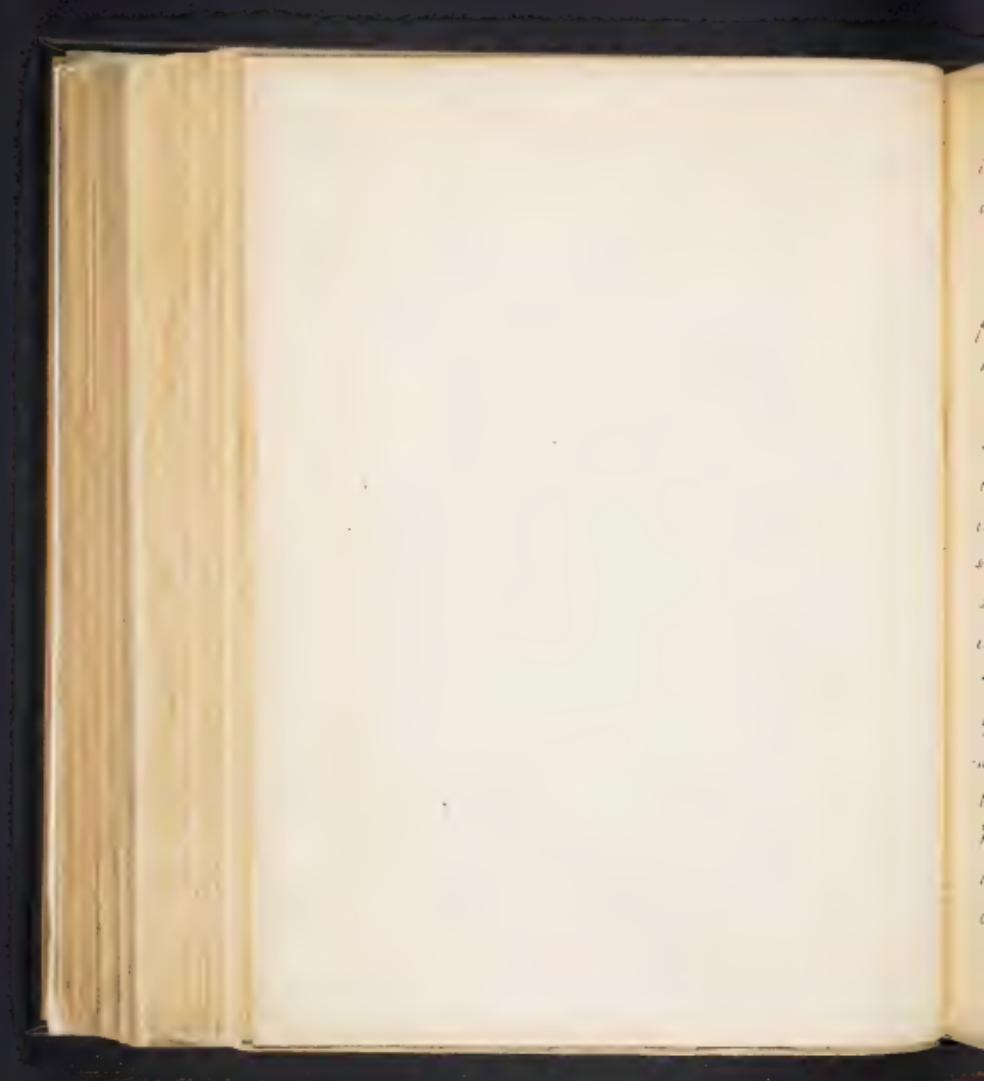
or, The Practitioner, claiming it, as coming
under their own immediate province;
It has consequently been very much neg-
lected; - The Chemist, it is true, has paid con-
siderable attention to its proximate and
constituent principles: - The Physiologist,
to its vital Phenomena: - And the Practi-
tioner, to its Morbid appearances, &c.
But, it may, I think, with some degree
of truth, be said, that each one, has
attended more particularly to his
own view of the subject, to the detri-
ment of all others. That it might be
my happy lot, to improve these things,
is my sincere desire, - but, more cannot
be expected, from a pen so inexperi-
enced as mine, - than a feeble attempt
to arrange and harmonize the facts
which have been so abundantly
advanced by a great number of con-

tributors. —

The Blood.

The Blood is a peculiar fluid, circulating throughout the vessels of all classes of animated beings; it penetrates into almost every recess of the Body, distributing itself through the numerous capillaries of its different vessels, of providing Nutriment and vitality. —

The importance of this fluid is very considerable; it distends the cavities of the heart and blood-vessels, and prevents them from collapsing; it also stimulates them to contraction, by which means, the circulation is performed. It is supposed to generate within itself animal Heat, which it propagates throughout the Body:



it nourishes the whole Body, and also,
is that source, from which, every secu-
tion of the Body is derived.

Blood when first drawn
from the vessels is in adhesive fluid of a
homogeneous consistence, and in the
Human subject of the temperature
of about 97° Fahr. - very soon after be-
ing drawn, it suffices to remain unless
it coagulates, and during that process
separates into two distinct parts, so that
at last, it appears, a red mass, floating
in a yellowish fluid. The red mass is
called the Crassamentum, and the
yellow fluid the Serum. The Crassa-
mentum usually floats in the Serum,
but instances have been recorded by De
Haen, Hunter, and by Hey, of the Crassa-
mentum enveloping the Serum. There
is also, another part, which will not con-



iate except by Extract of Lead, and which is denominated "Serosity".

The Halites.

— After Blood has been fresh drawn, and previous to its cooling, there is a steam or vapour continually flying off, which is found to consist of Carbon and Hydrogen. Thackrah says it differs very little from common water. Stenck, seems to have paid most attention to it; he calls it, "gas animal sanguineus," and says that it produces many very important effects in the animal economy. It has a putrid smell, between urine and sweat.

— Of the Coagulation of the Blood. —

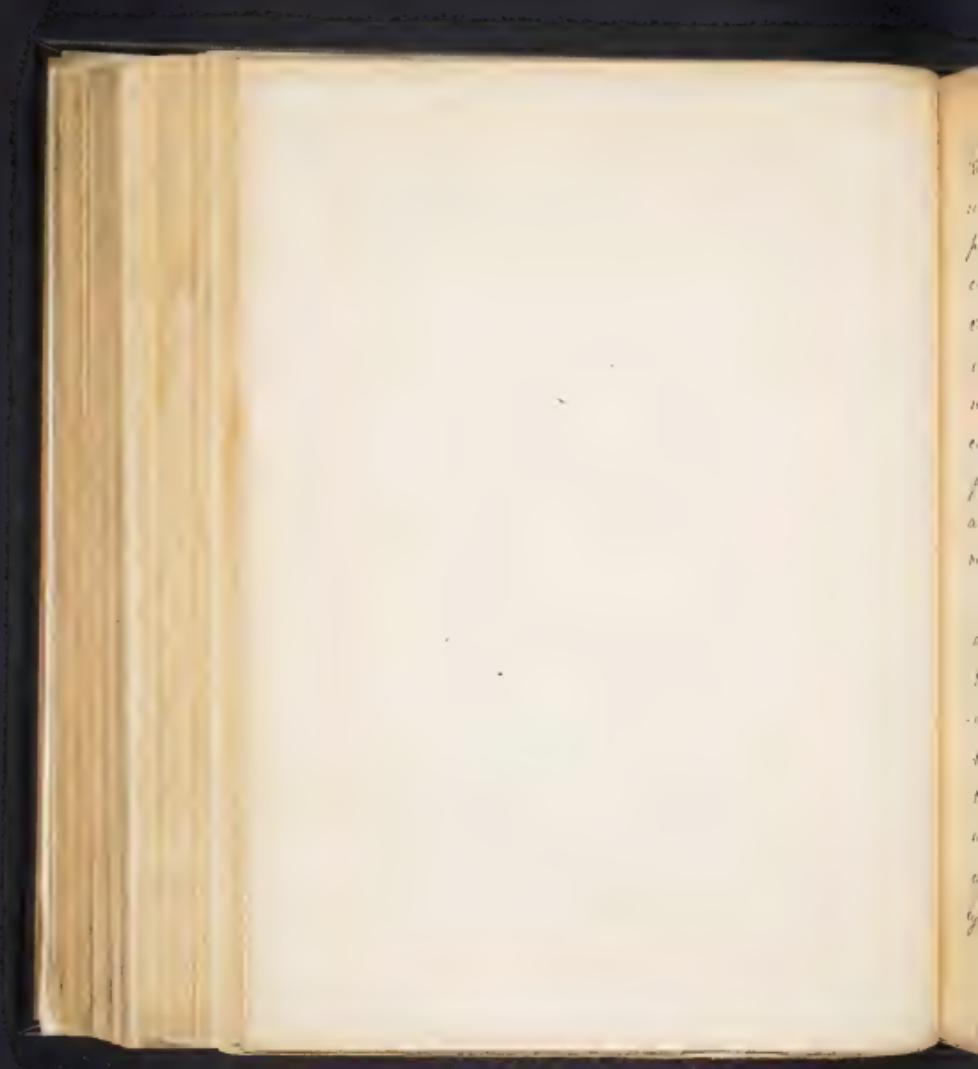
The first change which the blood undergoes after being drawn from the vessels is its Coagulation, the period for the completion of which pro-



cess, is averaged at about 3 minutes. Thack-
eray says it is fully completed, in from
3 to 8 minutes after being drawn, tho'
in some instances it is a much shorter
period, in coagulating. The first stage,
towards coagulation, is a species of decom-
position, which causes a separation of
the Serum: The Serum, constituting a
part of the whole mass, in the fluid
state: But, it is not exactly known, whether
the Serum, while the blood is circula-
ting, be a distinct part of the blood, as
we have no means of separating it,
from the Coagulation: The cause of
the coagulation of the blood, has never
been thoroughly explained, it is a circum-
stance which does not exactly resem-
ble any other with which we are ac-
quainted, and the operation of external
agents upon it, is not so well marked.

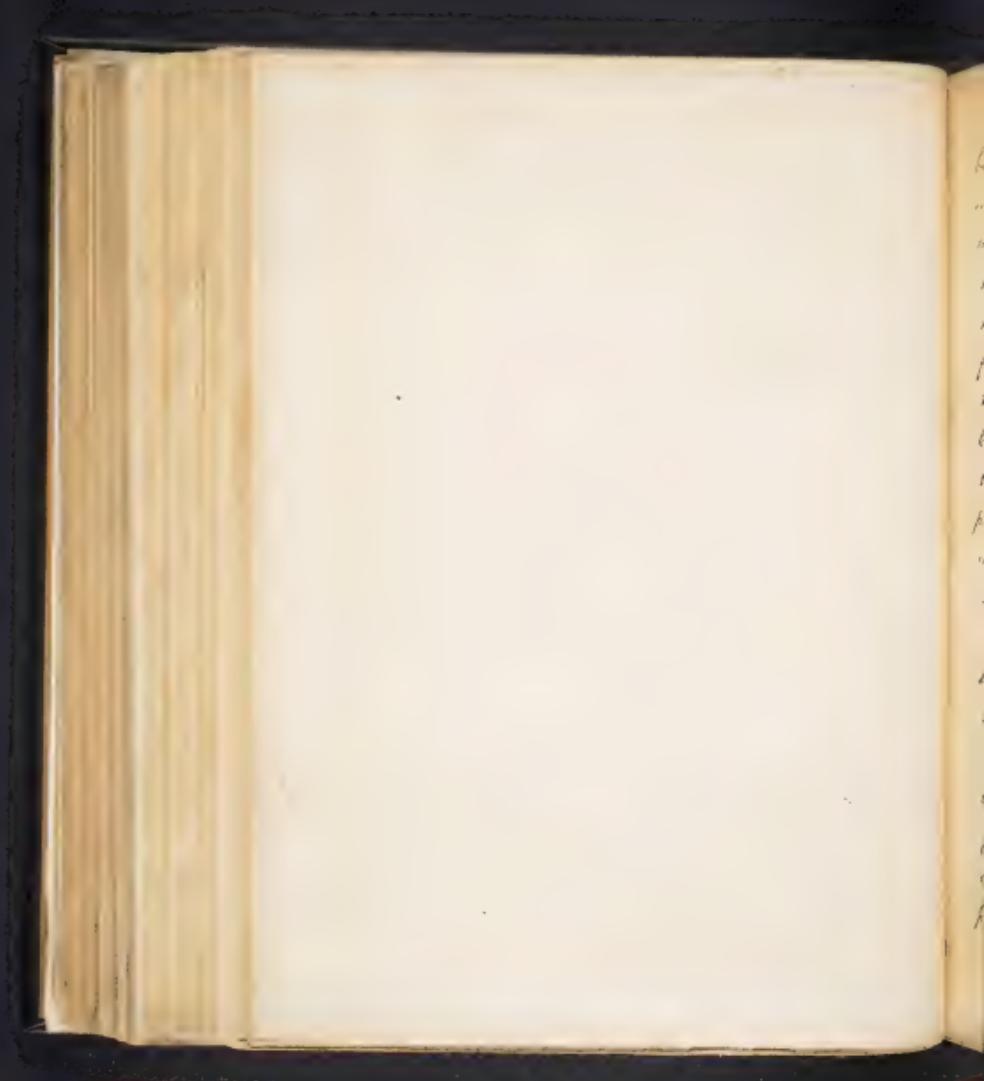


will enable us, to refer it, to any general
operation of the Physical properties of
matter. It was supposed that Coagu-
lation depended upon the action of
Heat, but this is not correct, for it will
coagulate "in vacuo". It was also thought
to depend upon the abstraction of heat,
but Heat has been found to hasten
the Coagulation. After the Grassamen-
tum has been exposed to the air, for
some hours, its exterior imbibes oxy-
gen, and assumes a florid hue;
this change resembling that produced in the
Lungs by respiration. It has also been obser-
ved, that if the Grassamentum, be not
kept moist, in the Serum, instead of
becoming scarlet, the colour becomes
a dark brown. In many kinds of
death we find, the blood does not coagu-
late. In some cases the muscles will con-



fract, and the blood will remain plenly,
in some cases, the contrary will take
place: while, in others, the blood will
coagulate only to the consistence of
cream. Blows on the stomach. Kill
immediately, since the muscles do
not contract, neither does the Blood
coagulate: death, caused by sevole
fits of passion is of this nature, -
and in most of these cases the body
very soon after death, becomes putre.

In many diseases, if accurately
attended to, there is no doubt, but
that we should find this correspon-
dence between the muscles, and the
blood; for, just as Hunter observes, when
there is strong action going on, the
muscles contract strongly after death,
and the blood also coagulates strong-
ly. The quantity of blood contained in the



body, has never yet been exactly ascertained. Sir Astley Cooper, supposes it to be about $\frac{1}{4}$ of the weight of the body: Having procured a dog, weighing 44 lbs he opened the internal jugular vein, from whence he obtained $3\frac{1}{4}$ of blood; he afterwards opened the common carotid artery and obtained $5\frac{1}{2}$ more; the dog then died, and Sir Astley supposed that there remained in the Heart, about $3\frac{1}{2}$ more of coagulated blood..

— of the Crassamentum. —

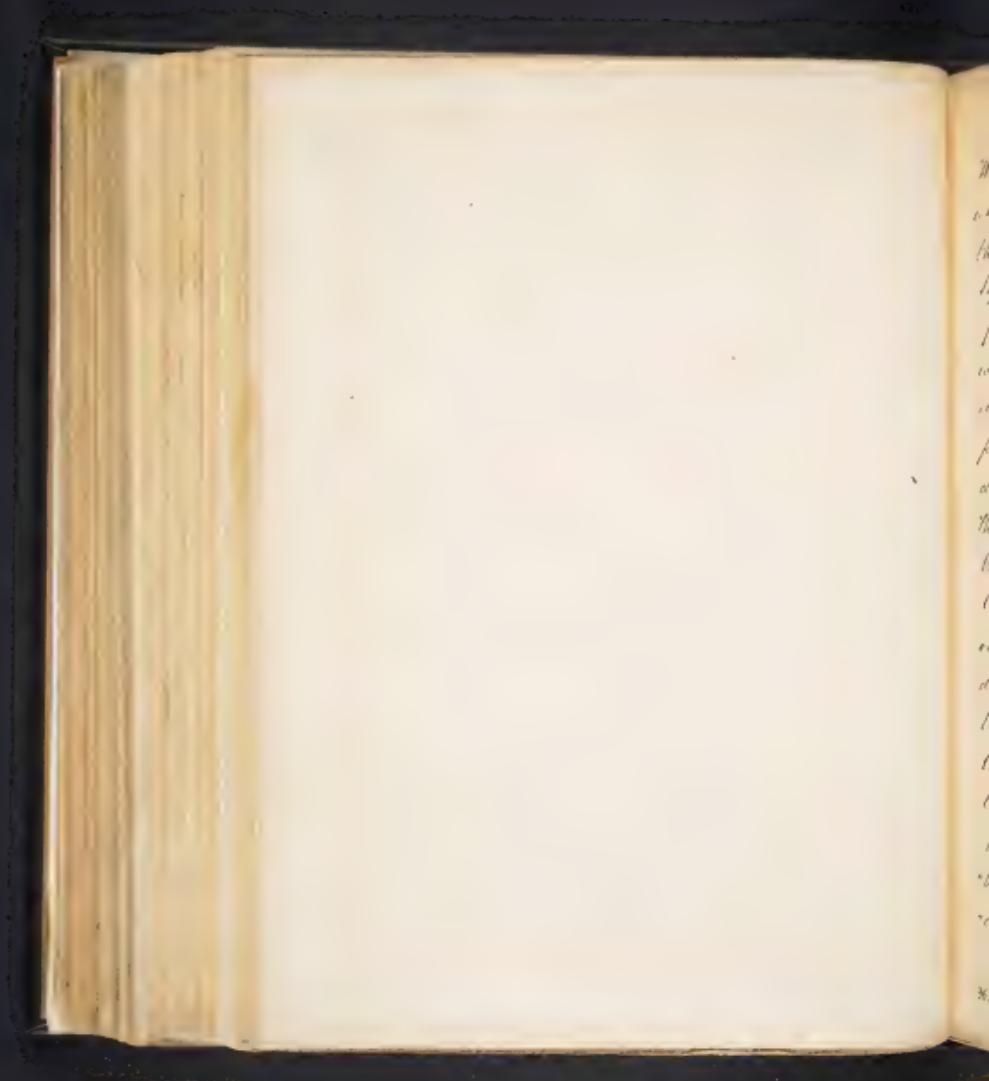
The Crassamentum may be separated by ablation into 2 parts, The Fibre, and the red Particles or Granules of the Fibre. — If fresh drawn blood, be stirred with a stick, for a few minutes, an adhesion of a substance, to the rough surface of the stick takes place, and this flaky substance, by



repeated washing, distinctly shows the
Gibrine which forms its basis. It con-
sists of light Carbon and Hydrogen,
the former of which prevails most;
It appears also from Hatchett, that
there exist some traces of albumen.
Gibrine is well diffusively soluble either
in Sulphureo acid, Alcohol or in solu-
tions of Ammonium, and is scarcely
at all affected by any other chemi-
cal agent.

— of the first Particles or Cryst. —

They have been supposed
to be circular: Mr. Hewson, describes
them as consisting of a solid core
surrounded by a vesicle filled with a flu-
id, he also says, that by adding water
to them, they swell out, and become
larger; he afterwards says, they are
soluble in, and in part then colour water.



When they are put into water, they dissolve, which destroys their globular form; it is therefore the Serum, and probably the coagulating lymph also, which circulates, which confines them to this globular form; but if we dilute the Serum with water they dissolve not, and this appears to take place in a moment; also, if we dilute with water, they dissolve in it. They are also soluble in vinegar; but if the vinegar be diluted with water, they will dissolve sooner in it, than in either vinegar or water alone, because pure vinegar dissolves them. They are said to be of the same size in the mouse as in the ox, - larger in birds, and still larger in the Skate-Fish. Baker,* speaking of the water-sow, states that the "globules appear about ten times as large" as those of the Human blood, and

*Employment for the Microscope.

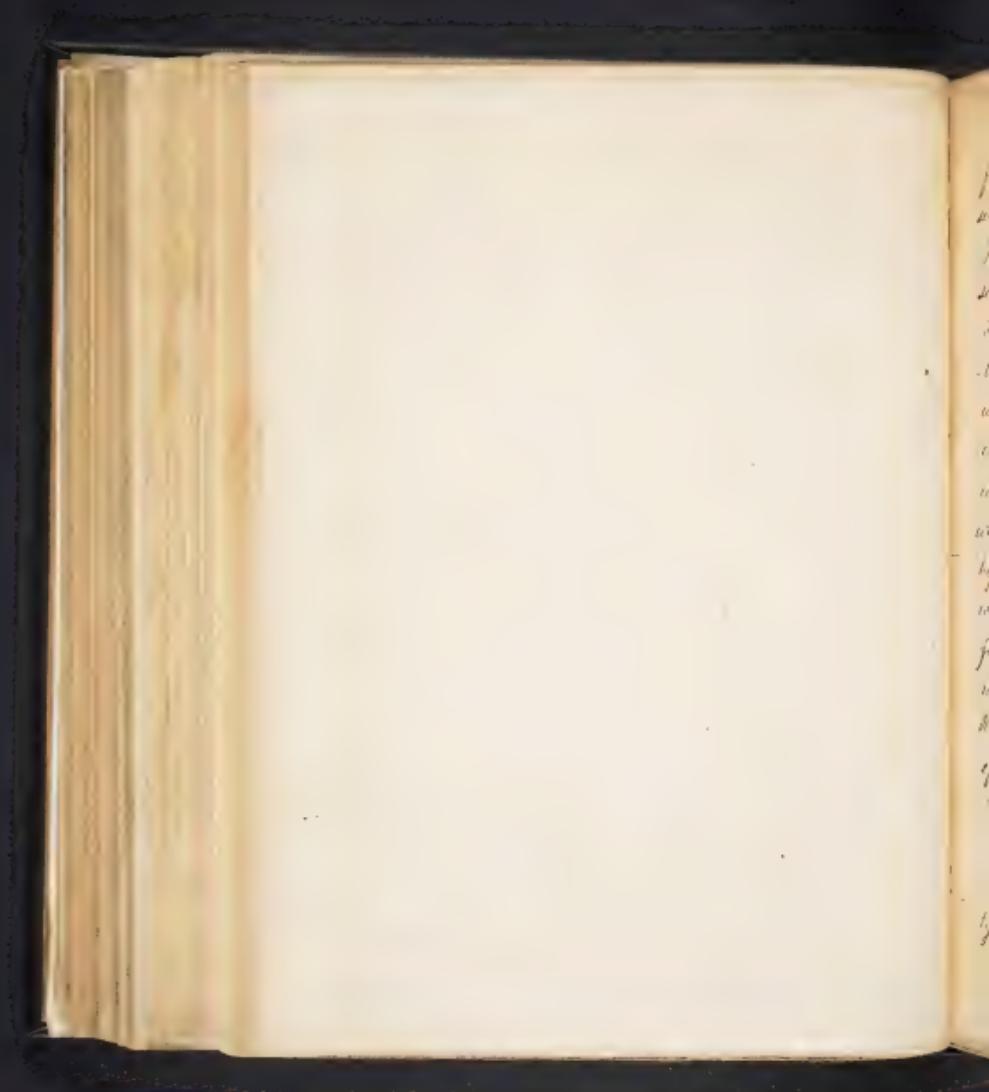


their progressive motion is very slow and law-
-gued, whereby, they become more distin-
-guishable than the globules are, in the
blood of animals whose circulations
"script?" - Since, considerably augmenting
their colour seems to convert it, too bright
red, while on the contrary there are some
substances, by which, their colour is des-
trayed without altering their form.
If we dilute Marascatto liqueur, soastabre
more pungent and three times stronger
than common vinegar, it does not des-
-troy them, but merely destroys their
colour; but, by adding more water
to them, they are dissolved. The Tartar
salts will also destroy their colour.
They do not circulate all over the
body: (for example, they do not circu-
-late in the conjunctiva.)



Of The Serum.

The specific gravity of the Serum, has usually been stated at 1020 to 1030. - Bostock considers it to be 1025: - and Marcolis 1029. The Serum, is that fluid part of the blood of a yellowish colour, rather inclining to green; It is heavier than water, and has the property of turning blue vegetable colours green. Coagulation is not necessary to separate the Serum, from the blood, for we find it separated in disease, as in Tropsy. In Tropsy the Serum constitutes about $1\frac{1}{2}$ of the whole mass of the Blood. It varies in quantity, in different persons; in the robust, it is small in proportion as $\frac{1}{3}$; in thin and emaciated people, it is much larger. The Sulphuric and other mineral acids readily coagulate Serum; and its albumen is precipitated in the form of a

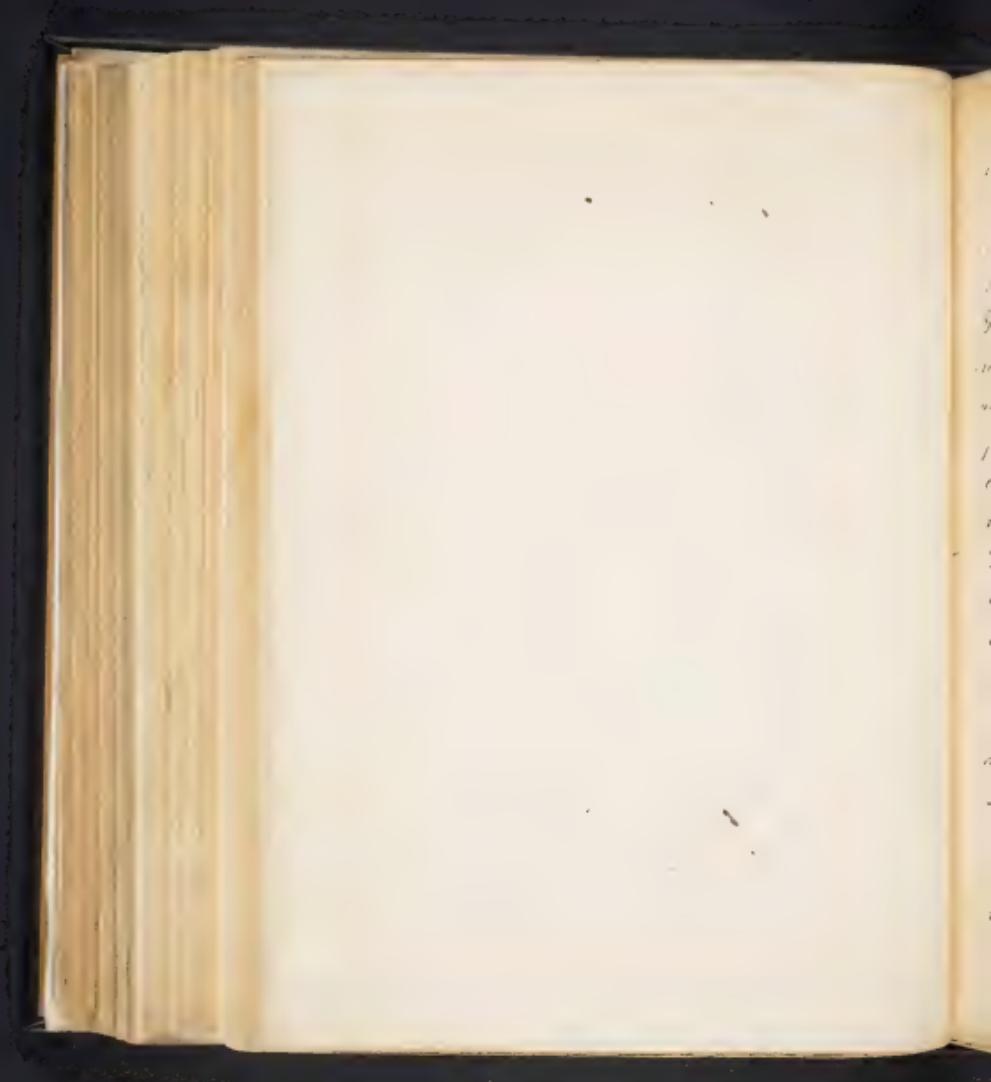


flaky mass. It will coagulate on expo-
sure to heat of 150° or 160° Fahrenheit. -

The use of the Serum, is probably, to keep
suspended the undissolved the red glo-
bules, for it is found in larger quan-
tity where these red globules are most
abundant. It is perhaps also interest-
ing, to suspect with kept dissolved,
any foreign substances in the blood,
whether of use to the body or otherwise,
by acting on them as a solvent. Thus,
we see, in a person afflicted with
jaundice, the Serum is yellower than com-
mon, also when a person has taken
etherbath, we may perceive the same
effect. W. Hunter, supposes it to be
the solvent of all our secretions.

of the Serosity.

The existence of the Serosity,
as a substance distinct from the albu-



ever, seems first to have been noticed by
Brett, in a Thesis published at Edinburgh,
in 1760. Its properties were still further
developed by Lavoisier, in his "Institutions."
It became the subject of more ex-
tensive chemical analysis in France, by Star-
mer and Seguin. The most im-
portant point, which the French chem-
ists stated in the results of their experi-
ments, is the discovery of a quantity of
Gelatine, contained in the Serosity, uni-
tect with a variety of other salts, from
which no mode, is at present known,
of separating it, without its being de-
composed. Dr. Marcet, gives it the
name of "Mucco-extractive matter."

— Of the Chemical Qualities, —

— of the Blood. —

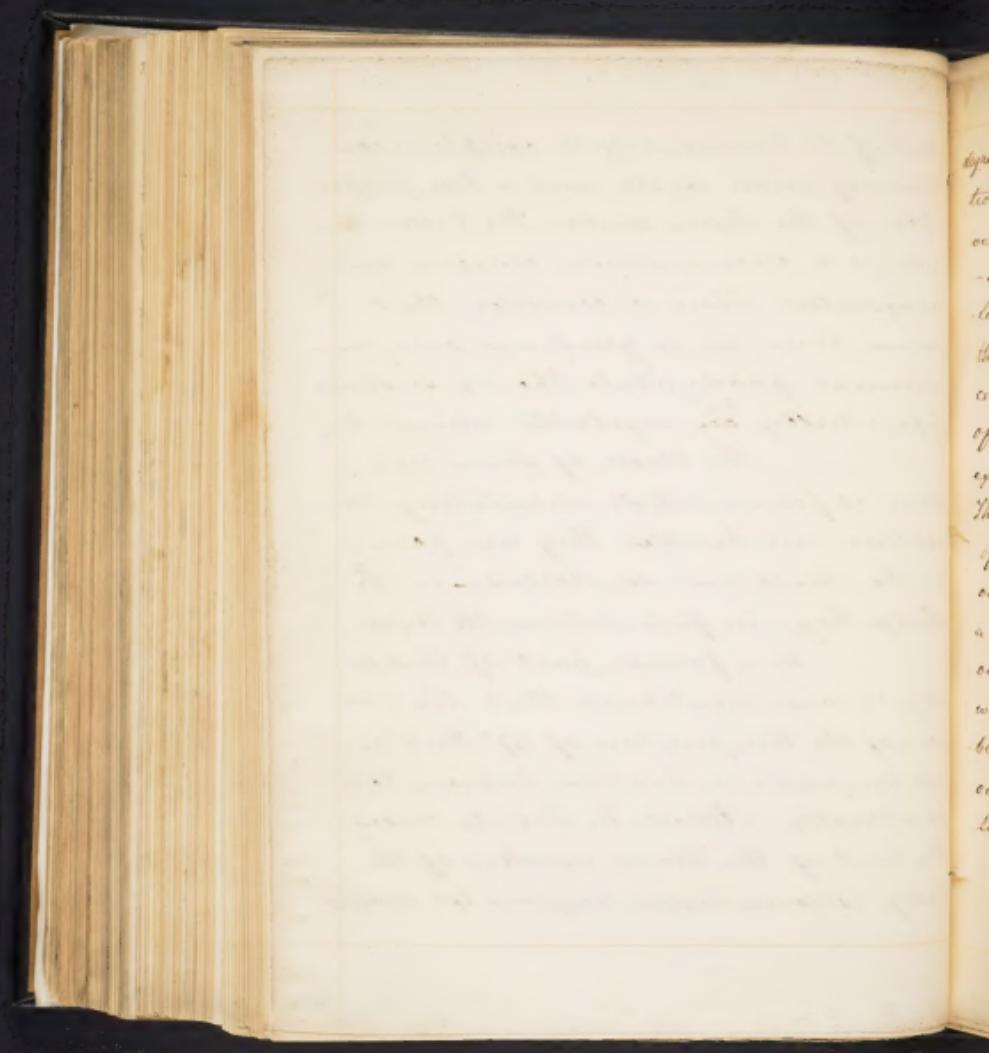
Bergelius states, that the
blood of the ox, differs in no respect, from



that of the human subject, except, in containing more azote, and a less proportion of the saline matter. The latter, however is a circumstance curious and unexpected, when we consider, that man, lives in a great measure, on animal food, while the ox sustains life, wholly ^{by} on vegetable aliment.

The blood, of some creatures, is found, while circulating, to contain air bubbles; they are found, in the land, and sea-tortoise, in the Hedge-Hog, in fish, and in the beaver.

In a former part of this as say, it was mentioned, that the blood was of the temperature of 97° Fahr.; - its temperature has been known to be materially altered. In Febrile cases, the heat of the blood, as well as of the body, is sometimes, augmented several



degrees, white, on the contrary, in some affections, the blood, as it flowed from the veins has produced, a marked sensation of cold; Morgagni has related several instances, in one of which, the Patient, compared the feeling produced by the stream on her arm, to that of Ice. In most of these cases, there existed some nervous affection; - Shuckrah also relates an instance of a woman; (Pregnant) he says, that on Bleeding her, the Stream produced a chilly feel, both on his finger and on the Patient's arm; he says the case was not attended with any remarkable symptoms, - the Patient suffering only from the ailments common to her condition.

